# Running economy

*Last reviewed: November 4, 2026*



*Advanced: for experienced endurance athletes.*

**Strength training, plyometrics and carbon-plated shoes all make a given pace cost less energy.**

**Why it matters:** Two runners with the same aerobic capacity can race at different speeds because one uses less energy per mile. Economy is one of the few performance factors you can improve without running more.

**The big picture:** Running economy is how much energy you use at a given pace. In a lab study, "super shoes" cut energy use by about 4% in fast runners. Better economy means the same pace feels easier.

## What to do with this

- **Lift heavy twice a week** in your base season (see "Strength training for endurance athletes").
- **Add plyometrics** to your lifting: hops, bounds and jumps, once or twice a week (see "Plyometrics: jumps and throws"). The combination worked best.
- **Consider modern racing shoes** for key races, knowing the best evidence comes from fast runners.
- **Keep running consistently.** Economy is shaped by years of training as well as specific work.

## Go deeper

**The terms:**

- **Running economy:** the oxygen or energy cost of running at a given speed. Lower cost means better economy.
- **Heavy strength training:** lifting at about 80% or more of your one-rep max.
- **Plyometrics:** quick jumps and hops that train muscles and tendons to store and return energy.
- **Super shoes:** racing shoes with thick, highly resilient foam and usually a stiff carbon-fiber plate.

**What people believe:** Economy is fixed by your body type, or that lifting will make you heavier and less efficient.

**Strength and plyometrics:**

- A 2024 meta-analysis found heavy strength training (80% of one-rep max or more) improved running economy in middle- and long-distance runners, especially at faster speeds and in runners with higher aerobic capacity [1].
- Programs combining heavy lifting with jumps gave the largest improvement. Jump training alone helped only at slower speeds, about 7.5 mph (12 km/h) or less. Moderate loads and isometric holds didn't clearly help [1].
- A review found heavy strength training also improves cycling economy [2].

**Shoes:**

- In a 2018 lab study, 18 male runners who had run 10K under 31 minutes used about 4% less energy in a prototype carbon-plated shoe than in two established racing shoes. Every runner improved, with savings from 2 to 6% [3].
- The study was funded by the shoe maker, and the runners were young, fast men. How much slower runners gain is less certain [3].

**Between the lines:** Strength work and plyometrics are cheap, proven ways to improve economy. Shoes help too, but the size of the benefit for recreational runners isn't settled.

**Reality check:** Economy gains don't translate one-for-one into race times, and most studies lasted 6 to 24 weeks.

**How sure are we:** Moderate that heavy strength training improves running economy; low certainty that adding jumps improves it further. Moderate that modern racing shoes improve economy in fast runners. Early on how much shoes help slower runners.

## Improve your economy

1. **Twice a week:** heavy squats or leg press, Romanian deadlifts and calf raises, 3 sets of 4 to 6 (see "Strength training for endurance athletes").
2. **Once or twice a week:** 3 to 5 sets of 5 to 10 hops, bounds or box jumps, with full rest.
3. **Strides:** 4 to 6 relaxed 20-second pickups after easy runs.
4. **Save racing shoes** for key workouts and races, and test them before race day.

# Sources


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2. Rønnestad BR, Mujika I. Optimizing strength training for running and cycling endurance performance: a review. *Scandinavian Journal of Medicine & Science in Sports*. 2014;24(4):603–612. doi:10.1111/sms.12104
3. Hoogkamer W, Kipp S, Frank JH, Farina EM, Luo G, Kram R. A comparison of the energetic cost of running in marathon racing shoes. *Sports Medicine*. 2018;48(4):1009–1019. doi:10.1007/s40279-017-0811-2